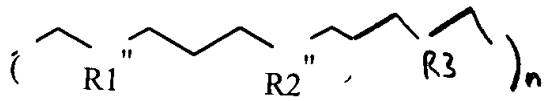
42. A polymer having the following structure:



wherein R1 is an element selected from the group consisting of O, N, B, and S, wherein R2 is an element selected from the group consisting of O and P, wherein said phosphorus is either in the $^{+}3$ or $^{+}5$ oxidation state, and wherein R3 is selected from the group consisting of aromatic and aliphatic groups.

43. The polymer of claim 41, wherein said polymer has a molecular weight (M_n) ranging from about 400 to about 1,000,000.

Remarks

It is axiomatic in patent law that if an independent claim defines patentable subject matter, then claims depending therefrom also define patentable subject matter. This axiom applies to the following arguments.

Rejection of claims 1, 6, 11 and 13 are rejected under 35 USC 102(a) and 102(e)

Claims 1, 6, 11 and 13 are rejected under 35 USC 102(a) and 102(e) as being anticipated by Watanabe *et al.* (US 6,180,287). Applicants respectfully disagree.

The Examiner states that "Watanabe *et al.* disclose a polymer electrolyte comprising an electrolyte salt and a polyether with linkages comprising two carbons, where the polyether has a molecular weight ranging from 1,000 to 1,000,000. The polyether may also include silicon-containing moieties where the silicon atom is connected to an alkoxy group, thus forming an oxy-silicon group. Thus, the polymer comprises alternating oxygen atoms and oxy-silicon groups connected by saturated alkyl linkages."

Section 102 of Title 35 provides the novelty requirements for patentability. In order for a prior art reference to anticipate a claim it must teach each and every element of that claim. M.P.E.P. §2131. The Court of Appeals for the Federal Circuit states:"[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628 (CAFC, 1987).

New claim 16 corresponds to previous claim 1 that has been canceled, therefore our comments are made in reference to new claim 16 and the claims that depend thereform. However, it is important to note that new claim 16 contains limitations not found in previous claim 1. Claim 16 claims a polymer comprising either one or more saturated alkyl or fluoroalkyl carbon links, wherein the links connect alternating nitrogen, sulfur or oxygen atoms, alternatively, the links connect either an oxygen, nitrogen or sulfur atom through one or more saturated alkyl or fluoroalkyl carbon links to an oxy-phosphorous group, an oxy-silicon group oxyboron, oxyalumnium group or a combination thereof, wherein the oxy-phosphorous group can have a valence of III or V, and wherein the linkage includes crosslinkage.

Applicants concede that Watanabe discloses a polymer, however the polymer that is disclosed is a linear polymer. This is in contrast to Applicants' claimed invention which claims a polymer having crosslinkages. Moreover, Watanabe fails to disclose the inclusion of elements P, N, or S, whereas, Applicants claim the combination of these elements in their invention.

Based upon the rule articulated by the CAFC, *supra*, Watanabe fails to anticipate the presently claimed invention by failing to "teach each and every element" of the claimed invention, in particular claim 16 and the claims depending therefrom. Therefore, Applicants respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 1, 6, 11 and 13 are rejected under 35 USC 102(e)

Claims 1, 6, 11 and 13 are rejected under 35 USC 102(e) as being anticipated by Ulrich *et al.* (US 6,472,104). Applicants respectfully disagree.

The Examiner states that "Ulrich *et al.* disclose a polymer electrolyte in which polyethylene oxide units are joined to oxy-silicon units ... which would result in a polymer where alternating oxygen atoms and oxy-silicon groups connected by saturated alkyl linkages. The polyethylene oxide units ... have molecular weights ranging from 100 to 10,000 ... which would result in the overall polymer having an average weight falling in the present range of 200 to 1,000,000. The electrolyte also contains a lithium salt."

As was true for Watanabe, Urlich fails to anticipate the presently claimed invention. For example, Urlich fails to teach a cross-linked polymer as is claimed in the current invention. Further, Urlich in column 2, lines 44-45 states that "the silicon containing precursor is preferably a functionalized orthosilicate containing at least one Si-C bond." The presently claimed invention claims silicon atoms connected in the polymer through Si-O bonds. Urlich fails to disclose the inclusion of elements P, N, or S in their polymer, whereas those elements are claimed in the present invention.

Urlich fails to teach each and every element of the Applicants' presently claimed invention, therefore, fails to anticipate Applicants' claimed invention. Thus, Applicants respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 1, 11 and 13 are rejected under 35 USC 102(b)

Claims 1, 11 and 13 are rejected under 35 USC 102(b) as being anticipated by Chen *et al.* (US 5,593,765). Applicants respectfully disagree.

The Examiner states that "Chen *et al.* disclose a polymer electrolyte made from dithiols, which contain internal oxygen, sulfur, or nitrogen atoms, or oxy-phosphorus groups ... and from divinyl ethers ... which would result in a polymer having oxygen and

sulfur atoms, optionally with nitrogen atoms or oxy-phosphorous groups connected by saturated alkyl groups ... the electrolyte also includes at least one salt."

Applicants agree that Chen *et al.* disclose a polymer electrolyte with certain elements, however, these elements do not include B, Al or Ti as is claimed in the present invention. Moreover, Chen is silent on the size (molecular weight) of their polymer. These significant differences indicate that Chen cannot be used to anticipate the presently claimed invention. Therefore, Applicants respectfully request reconsideration and withdrawal of this rejection.

Rejection of claims 1, 3, and 11 - 13 are rejected under 35 USC 102(b)

Claims 1, 3, and 11 - 13 are rejected under 35 USC 102(b) as being anticipated by Yasukawa *et al.* (US 4,798,773). Applicants respectfully disagree.

The Examiner states that "Yasukawa *et al.* disclose a polymer electrolyte including a salt and a silicon-containing polymer. The polymer includes either polyethylene oxide or polypropylene oxide linkages ... where an oxygen atom within the linkage would be bonded to the silicon atom ... the polymer would include saturated alkyl linkages having two or three carbons, connecting alternating oxygen atoms and oxy-silicon groups ... the alkyl linkage may itself be branched.

Yasukawa *et al.* disclose a polymer electrolyte containing a salt. The disclosure fails to recite elements other than Si, O, or C in their polymer. For example, there is no mention of using B, Al or Ti, unlike what is claimed in the present invention. This is a significant difference between what is currently claimed and the cited reference. Hence, the reference fails to anticipate the presently claimed invention and therefore Applicants respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 1, 5 and 13 are rejected under 35 USC 102(b)

Claims 1, 5 and 13 are rejected under 35 USC 102(b) as being anticipated by Chaloner-Gill (US 5,393,621). Applicants respectfully disagree.

The Examiner states that "Chaloner-Gill discloses a polymer electrolyte comprising an organophosphorous polymer having a number average molecular weight ranging from 1,000 to 80,000 and an inorganic salt. The polymer includes oxy-phosphorous units connected by hydrocarbon or oxyhydrocarbon units. These units would be saturated. Thus, the polymer would include saturated hydrocarbon units connecting oxygen atoms and oxy-phosphorous groups."

Chaloner-Gill does not anticipate the presently claimed invention. For example, the cited reference fails to teach the use of Al, Ti, B, S, N or Si in a polymer as is claimed in the current invention. Moreover, Chaloner-Gill fails to disclose the inclusion of a salt with the phosphorous polymer to form a polymer electrolyte, again, as is claimed in the present invention. Clearly, Chaloner-Gill fails to anticipate the presently claimed invention. Therefore, applicants respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 1, 2 and 13 are rejected under 35 USC 102(b)

Claims 1, 6, 11 and 13 are rejected under 35 USC 102(b) as being anticipated by Daroux *et al.* (US 5,648,186). Applicants respectfully disagree.

The Examiner states that "Daroux *et al.* disclose polymer electrolytes which include a macromolecule having a weight above 10,000 ... and a salt ... the polymer includes polyethylene oxide branches connected to a core which contains nitrogen atoms connected by two carbons. Thus, the polymer includes two-carbon spacers connecting oxygen and nitrogen atoms ..."

Daroux does disclose a combination of polyethylene oxide chains, however, it cannot serve as an anticipating reference. Daroux fails to teach the use of elements Si, P, B, Ti, Al or S in combination as is claimed in the present invention. Therefore, this reference cannot be used to anticipate the presently claimed invention. Applicants therefore respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 1, 2, 4 and 12 are rejected under 35 USC 102(b)

Claims 1, 2, 4 and 12 are rejected under 35 USC 102(b) as being anticipated by Jacquet *et al.* (US 4,390,689). Applicants respectfully disagree.

The Examiner states that " Jacquet discloses a polymer ... in which nitrogen atoms are connected to oxygen or sulfur atoms ... via alkylene groups which may be substituted. The molecular weight ranges from 1,000 to 50,000.

The cited reference discloses that the nitrogen of their polymer is a quarternary ammonium nitrogen. This is significantly different from what is presently claimed. In the claimed invention a ternary nitrogen is claimed. Moreover, Jacquet fails to anticipate the employment of Si, P, B, Ti, Al or S as is claimed in the current invention. These differences between the cited reference and that which is claimed betray the fact that Jacquet cannot be properly used to anticipate Applicants' claimed invention. Therefore, Applicants respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 1 and 11 are rejected under 35 USC 102(b)

Claims 1 and 11 are rejected under 35 USC 102(b) as being anticipated by Cyba (US 3,598,855). Applicants respectfully disagree.

The Examiner states that "Cyba discloses polymers which include oxy-boron groups and nitrogen atoms optionally connected by saturated hydrocarbon spacers having one or two carbons."

Importantly, Cyba discloses polymers having alkyl links which are not ethylene oxide in nature, rather, they are saturated ethylene links. Further, Cyba fails to disclose the use of elements such as Si, P, Ti, Al, or S in combination as is claimed in the present invention. Clearly, Cyba does not anticipate the presently claimed invention and therefore, Applicants respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 1, 11 and 12 are rejected under 35 USC 102(e)

Claims 1, 11 and 12 are rejected under 35 USC 102(a) and 102(e) as being anticipated by Kolouch (US 5,312,814). Applicants respectfully disagree.

The Examiner states that "Kolouch discloses polymers which include fluorocarbon spacers having two or three carbons, connecting oxygen atoms and oxy-phosphorous groups. The polymers may include functional substituents attached to the ends of side chains which contain these spacers, or not at the ends, which would form a further substituted side chain."

Kolouch discloses a functionalized fluoropolymer adhesive in which a fluoropolymer is blended with a functionalized fluoropolymer. The functionalized fluoropolymer may contain certain groups like sulfonic acid or phosphonic acid, but these groups are by definition pendant to the polymer backbone (see, column 3, lines 55-56). In contrast, in the presently claimed invention, the P or S atoms reside in the polymer backbone. Additionally, Kolouch fails to disclose combining elements such as Si, P, Ti, Al or S as is claimed in Applicants' invention. Further, Kolouch is silent as to the molecular weight of his disclosed polymers. These difference are significant between the cited reference and the claimed invention. Therefore, Applicants respectfully request reconsideration and withdrawal of the present rejection.

Rejection of claims 2, 3, and 5 under 35 USC 103(a)

Claims 2, 3, and 5 are rejected under 35 USC 103(a) as being unpatentable over Chen *et al.* (US 5,593,765); claim 5 is also rejected as being unpatentable over Kolouch (*supra*) Applicants respectfully disagree.

According to the Examiner, "Chen *et al.* disclose a polymer having oxygen and sulfur atoms, optionally with nitrogen atoms or oxy-phosphorous groups connected by saturated alkyl groups ... they do not disclose the molecular weights of their polymer. However, since the molecular weight would effect such properties as mechanical strength

... and ionic conductivity ... the average molecular weight of the polymers of Chen *et al.* would be a matter within the skill of the ordinary artisan ..."

Further, the Examiner states, "Kolouch does not disclose a molecular weight for his polymer. However, his disclosure is concerned with various properties such as melt-flowability and adhesion. Since molecular weight would have some effect on these macroscopic properties, determining an optimal molecular weight range for the polymers ... would be within the skill of the ordinary artisan."

As argued above, the base claim, *i.e.*, claim 16, is allowable over Chen *et al.* and Kolouch for the reasons previously stated. Given that the base claim defines patentable subject matter, it follows that claims dependent therefrom also define allowable subject matter. Hartness International, Inc. v. Simplimatic Engineering Co., supports this proposition, which held, "[a] fortiori, [the] dependent claim ... was nonobvious (and novel) because it contained all the limitations of the [the independent] claim ... plus a further limitation." 819 F.2d 1100, 1108. 2 USPQ2d 1826, 1831 (Fed. Cir. 1987). Therefore, Applicants respectfully request reconsideration and withdrawal of the present rejection.

The Examiner is invited to call the undersigned attorney at (617) 854-4237 should he determine that a telephonic interview would expedite prosecution of this case.

Respectfully submitted,

Stephen J. Gaudet, Ph.D.
Attorney for Applicants
Reg. No. 48,921

Date: 3/31/03

CLAIMS
(clean version)

What is claimed is:

16. A polymer comprising either one or more saturated alkyl or fluoroalkyl carbon links, wherein said links connect alternating nitrogen, sulfur or oxygen atoms, alternatively, said links connect either an oxygen, nitrogen or sulfur atom through one or more saturated aryl, alkyl or fluoroalkyl carbon links to an oxy-phosphorous group, an oxy-silicon group oxyboron, oxyalumnium group or a combination thereof, wherein said oxy-phosphorous group can have a valence of III or V, and wherein said linkage includes crosslinkage.

17. The polymer of claim 16, wherein said polymer has a molecular weight (M_n) of about 200 to about 1 million.

18. The polymer of claim 17, wherein said polymer comprises alternating oxygen and nitrogen atoms and linked via saturated aryl, alkyl or fluoroalkyl carbon linkers.

19. The polymer of claim 17, wherein said polymer comprises alternating oxygen and sulfur atoms and linked via saturated aryl, alkyl or fluoroalkyl carbon linkers.

20. The polymer of claim 17, wherein said polymer comprises alternating sulfur and nitrogen atoms and linked via saturated aryl, alkyl or fluoroalkyl carbon linkers.

21. The polymer of claim 17, wherein said polymer comprises alternating oxygen atoms and oxyphosphorous groups and linked via saturated aryl, alkyl or fluoroalkyl carbon linkers.

22. The polymer of claim 17, wherein said polymer comprises alternating oxygen atoms and oxysilicon groups and linked via saturated aryl, alkyl or fluoroalkyl carbon linkers.

23. The polymer of claim 17, wherein said polymer comprises alternating nitrogen atoms and oxyphosphorous groups and linked via saturated aryl, alkyl or fluoroalkyl carbon linkers.

24. The polymer of claim 23 further comprising an electrolyte salt, wherein said salt has a weight ratio sufficient to form a polymer electrolyte, and wherein said salt is selected from the group consisting of alkali metal, quaternary ammonium, quaternary phosphonium, sulfonylimide, and sulfonylmethide.

25. The polymer of claim 24, wherein said polymer is cast as a film.

26. The polymer of claim 17 or 23, wherein said nitrogen atoms are either fully or partially substituted with one or more aryl, alkyl or fluoroalkyl tertiary substituents.

27. The polymer of claim 26 further comprising an electrolyte salt, wherein said salt has a weight ratio sufficient to form a polymer electrolyte, and wherein said salt is selected from the group consisting of alkali metal, quaternary ammonium, quaternary phosphonium, sulfonylimide, and sulfonylmethide.

28. The polymer of claim 27, wherein said polymer is cast as a film.

29. The polymer of claim 17 or 23, wherein one or more phosphorous atoms of said polymer are either fully or partially substituted with one or more aryl, alkyl or fluoroalkyl tertiary substituents.

30. The polymer of claim 17 or 23, wherein said nitrogen and phosphorous atoms are either fully or partially substituted with one or more aryl, alkyl or fluoroalkyl substituents.

31. The polymer of claim 16, wherein said polymer is an oxyphosphorous polymer, and wherein said oxyphosphorous polymer is combined with a group selected from the group consisting of oxysilicon, oxyboron, oxyaluminium and a combination thereof.

32. The polymer of claim 16, wherein said links comprise (i) two to four carbons in length, and (ii) one or more aryl, alkyl or fluoroalkyl branches.

33. The polymer of claim 16, wherein said links comprise one or more side chain substituents.

34. A solid polymer electrolyte, comprising (i) at least one polymer from claim 16, and (ii) at least one electrolyte salt.

35. The polymer of claim 34 further comprising an electrolyte salt, wherein said salt has a weight ratio sufficient to form a polymer electrolyte, and wherein said salt is selected from the group consisting of alkali metal, quaternary ammonium, quaternary phosphonium, sulfonylimide, and sulfonylmethide.

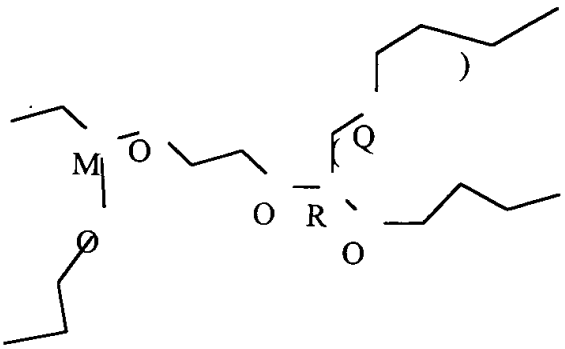
36. The polymer of claim 35, wherein said polymer is cast as a film.

37. A polymer having the following formula:

$$[\text{-RP}(R^1)R^2\text{-}]_n$$

wherein R, R^1, and R^2 are selected from the group consisting of alkyl, alkylene and aryl hydrocarbons, and wherein "n" is an integer from 1 to 10,000.

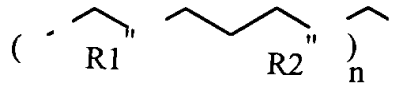
38. A polymer having the following structure:



wherein R is an element selected from the group consisting of P, B, and Al, wherein M is an element that is either Si or Ti, wherein Q is an element chosen from the group consisting of S, O, and N, and wherein said phosphorous is either in the $^{+}3$ or $^{+}5$ oxidation state.

39. The polymer of claim 38, wherein said polymer has a molecular weight (M_n) ranging from about 400 to about 1,000,000.

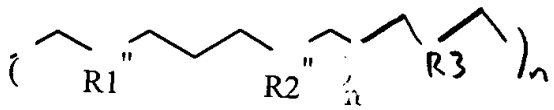
40. A polymer having the following structure:



wherein R1 is an element selected from the group consisting of O, N, B, and S, wherein R2 is an element selected from the group consisting of O and P, wherein said phosphorus is either in the $^{+}3$ or $^{+}5$ oxidation state.

41. The polymer of claim 40, wherein said polymer has a molecular weight (M_n) ranging from about 400 to about 1,000,000.

42. A polymer having the following structure:



wherein R1 is an element selected from the group consisting of O, N, B, and S, wherein R2 is an element selected from the group consisting of O and P, wherein said phosphorus is either in the $^{+}3$ or $^{+}5$ oxidation state, and wherein R3 is an element selected from the group consisting of aromatic and aliphatic groups.

43. The polymer of claim 42, wherein said polymer has a molecular weight (M_n) ranging from about 400 to about 1,000,000.